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FRENCH BAUXITE PROSPECTION MISSION IN THE LOWER MEKONG BASIN

PRELIMINARY REPORT

by Dr. H. CRUYS

Geology Expert of the French Bureau of Geological and Mining Researches,
Chief of Mission

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I. INTRODUCTION

Bauxite, a highly aluminous lateritic substance (with aluminum trihydrate or monohydrates) is the typical aluminum ore.

It is found in several genetic forms, of which the principal ones are the following:

(a) Bauxites which originated from large alluvial deposits of kaolin and clay or kaolinous shale, through weathering of large hinterland plateaux composed of masses of silico-aluminous rocks.

This type is found in particular in the coastal sedimentary series, of the tertiary or quaternary era, of Surinam and British Guiana.

(b) Bauxites formed "in situ" from alumino-silicated rocks, of eruptive or metamorphic origin and of widely differing age and petrographic nature.

The formation of bauxite is then due to a process of laterization usually preceded by profound clayey weathering of rocks producing mainly kaolinite, transformed into bauxite on location.

The various original rocks which produce aluminous laterites include:

- granites and gneisses, feldspathic hornfelses, rhyolites, syenites, diorites, porphyries, gabbros, norites, andesites, diabases, basalts, dolerites, phonolites, volcanic tuffs, amphibolites, shales, phyllites (Malaya, Indonesia, Sarawak, India, U.S.A., British and French Guianas, Surinam, Brazil, Guinea, Ghana, Nyassaland, Australia, Ireland, Germany).

/(c) Bauxites

(c) Bauxites associated to karstic surfaces which developped in formations of carbonated rocks (limestones and dolomites) of the tertiary, mesozoic and paleozoic eras.

(Jamaica, Haiti, France, Italy, Austria, Hungary, Yugoslavia, Rumania, Turkey, U.S.S.R., North Viet-Nam).

We may note that there are two theories concerning the origin of bauxite-yielding substances and the genesis of bauxite deposits:

(1) Native origin: bauxite deposits are formed from limestone or dolomite, through dissolution of those carbonated rocks. The raw material of bauxite would then be the "Terra Rossa", which is considered as a decalcification clay, a reddish and insoluble residual product of limestone and dolomite.

(2) Foreign ofigin: bauxites are formed from more or less kaolinous or lateritic alluvial deposits, which accumulated during emersion periods in the funnels and cavities in the karst of lime-dolomitic formations, through erosion of residual clays and laterized soils which developed on high-level masses of silico-aluminous rocks.

We may add that the above-mentioned rocks and substances would lead to the formation of bauxite (in ancient or recent times) only in special conditions, in particular from the point of view of climate and geomorphology, namely, in tropical areas with rainy seasons, and on morphologically favourable areas with a vegetal cover (plateaus, peneplains, domes, large slightly inclined slopes).

Purpose of the Mission

Reconnaissance of bauxite occurrences, first-phase prospection with a view to determining the possibilities of bauxite in the Lower Mekong Basin or in adjacent areas belonging to its economic sphere.

II. GEOLOGY AND RESEARCH. PROGRAMME OF WORK IN THAILAND

No special bauxite prospection has ever been attempted in Thai land. No occurrences of aluminous laterite have been reported so far.

/The Khorat

The Khorat Plateau includes the Thai part of the Lower Mekong Basin. By its geographic location, it may be of great interest as concerns bauxite. However, its geologic constitution is not favourable to bauxite possibilities. According to available geologic data, the "Khorat Series", a triassic and jurassic continental formation which covers that vast plateau, is composed essentially of lithological elements which cannot be considered as good mother-rocks for the formation of bauxite (sandstone, shale and quartzite conglomerate).

Further, on the basis of the literature and data we have been able to obtain from various departments in Bangkok, it would appear that certain specially favourable substances and mother-rocks are not found in that area, e.g. (a) sedimentary kaolin, clay and kaolinous shale; (b) gabbro or dolerite sills and large basalt or andesite outflows.

(Let us mention in this respect that no occurrence of aluminous laterite was found in the small basaltic outflows on the southern rim of the plateau).

In brief, we believe at present that the geology of that region, in so far as it is known today, does not justify research for bauxite on the Khorat Plateau.

In consequence, our reconnaissance work will be mainly concentrated in the adjacent area to the west of the Khorat Plateau, which we have provisionally delineated by the strategic landmarks of the three following dams (under investigation or under construction):

- Pa Mong (1,500,000 kW) on the Mekong, to the North-East
- Kang Riang (100,000 kW) on the Kwae Yai, to the South-West
- Yan Hee (560,000 kW) on the Nam Ping, to the North-West

This vast north-south oriented region includes several zones:

(a) The alluvial basin of the Nam Chao Phraya covers the middle part of the region.

On principle, this large basin might be considered for prospection of sub-alluvial bauxite deposits (see Type (a) mentioned in the Introduction).

/However, this

However, this type of deposit cannot be investigated at the present time, because such prospection would necessarily involve relatively long and specialized work, which could not be implemented during our first phase reconnaissance programme (relatively systematic surface prospection and geological surveys, completed by reconnaissance borings, and by geomorphologic and sedimentation studies).

(b) The eastern part, which borders upon the Khorat Plateau, and the western part of the selected area, could be investigated more rapidly. They include rugged areas with outcrops of a variety of rocks belonging to several geologic formations of different ages.

From the lithologic and stratigraphic viewpoint, certain of those rocks are prima facie favourable to the formation of aluminous laterites (see types (b) and (c) in the Introduction).

We may mention:

- the limestones of the "Ratburi" permo-carboniferous formation. Karstic processes have already been reported in that formation, in particular in the vicinity of Kanchanaburi.

(Let us mention in this respect that fossile lateritic formations, including true bauxites, are known to exist in the karstic masses of the permian limestones near Lang Son in North Viet-Nam).

- The granitic and dioritic rocks, andesites, basalts and porphyries of the various eruptive masses produced by the mesozoic and tertiary orogeneses.

(It may be worthwhile mentioning here that laboratory testing of samples collected in the red weathered clays of the basaltic Boloven plateau in Laos revealed relatively high alumina contents).

- In the absence of detailed geologic maps of those promising regions, the preliminary study of aerial photographs would be exceedingly useful. Together with the topographic mapping (scale 1/250,000 and 1/50,000), such photographs would enable us in particular to locate and delineate in those regions the

/most promising

most promising zones from the geologic and geomorphologic point of view, and possibly to spot those particular types of vegetation which are likely to be associated with outcrops of laterite caps.

The results of the photogeologic and morphologic surveys will be regularly checked by brief field reconnaissances of the successively selected areas, enabling us to complete at the same time the geologic documentation.

III. FIELD ORGANIZATION OF THE MISSION

(1) Immediately upon our arrival in Bangkok on 2 December 1961, we contacted various personalities concerned with the mission: Dr. C. Hart Schaaf, Dr. B. Binson, Mr. Sethaput, Dr. C.Y. Li, Mr. Saman Buravas, Mr. Nitipat Jalichandra.

(2) Prospection and camping equipment

We recently received part of our equipment from France. We expect to receive very soon the other essential part of our prospection equipment, which will be sent from Paris by air.

The camping equipment will be shipped by sea.

(3) Transport equipment

The all purpose Landrover vehicle (type 109) which we have ordered can be delivered only in late January 1962.

Realizing that we would not manage without a car in a large city like Bangkok and for our first field-trips, Mr. Vija Sethaput, Director of the Thai Department of Mines, gave us the loan of a new Landrover pending delivery of our own vehicle.

We wish to express our great appreciation to Mr. Sethaput for his very cooperative gesture and for his valuable technical assistance.

(4) Personnel

In accordance with the agreement, the Thai Department of Mines has appointed a young engineer, Mr. Sidhi Suddhibongse, to assist us, in particular during field missions.

/(6) Office Space

(6) Office Space

The Department of Mines has put at our disposal an office in its geology wing, where most of its engineers are working. However, our office is not large enough.

It would be desirable that an adequate office be made available to us in the near future to study the numerous aerial photographies and topographic maps, trace prospection charts and store samples and prospection equipment.

Bangkok, 30 December 1961

Dr. H. CRUYS
Geologist